APPENDIX F

Additional Cost Details

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Additional Cost Details

This appendix includes additional details on the cost estimates for the MWL CMS. These details include a description of the cost estimating software, the assumptions behind the long term monitoring costs, the estimation of waste volumes, and waste characterization and disposal costs. Definitions for key cost parameters are also included.

1. Cost Estimating Software

Costs for MWL CMS alternatives were primarily developed using the *RACER* (Remedial Action Cost Engineering and Requirements) *2001*™ cost-estimating model. *RACER* is a Windows-based environmental remediation/corrective action cost-estimating system, originally developed by the Air Force. *RACER* uses parametric estimating techniques to provide capital, operations, and maintenance cost estimates for remediation/corrective action projects. It is used by EPA, DOD, DOE, industry, state agencies, and environmental consultants to estimate costs for all phases of corrective action. *RACER* has been validated, verified, and accredited by the U.S. Amy Corps of Engineers, the Air Force Civil Engineer Support Agency, and Price Waterhouse Coopers.

Costs for ARS high bay warehouse facilities were estimated using the *PACES* (Parametric Construction Cost Estimating System) program, which is better suited for developing costs for buildings and infrastructure. Additional information on *PACES* is presented in Appendix D.

2. Long-Term Monitoring Costs and Assumptions:

Groundwater, Soil, Vegetation, and Air Monitoring Costs. Costs for thirty years of groundwater, soil, vegetation, and air monitoring are included in the following alternatives:

- Alternative MWL I.a - NFA with Institutional Controls
- Alternative MWL III.a. - Bio-Intrusion Barrier
- Alternative MWL III.b - Vegetative Cover
- Alternative MWL III.c - Vegetative Soil Cover with Bio-Intrusion Barrier
- Alternative MWL III.d - RCRA C Cap
- Alternative MWL III.e - RCRA C Cap with Bio-Intrusion Barrier
- Alternative MWL V.e - Future Excavation

Costs for 30 years of surveillance and maintenance are also included. Surveillance and maintenance activities may include seeding, mulching, grading, erosion control, signage, and fencing.

A detailed description of groundwater, soil, vegetation, and air monitoring activities, the frequency at which they will be performed, and corrective action triggers will be determined in consultation with the NMED and addressed in the MWL Post-Closure Care Plan.

Groundwater monitoring may consist of annual sampling of 5 monitoring wells, with one duplicate sample and one waste management sample. Groundwater samples may be analyzed for tritium, gross alpha/beta activity, gamma spectroscopy, target analyte list metals, volatile organic compounds, nitrate, major ions, and alkalinity. The estimated monitoring well life is 20 years. No costs are included for plugging and abandoning wells or construction of new wells.

Soil monitoring may consist of annual sampling of 8 soil locations at the MWL. Soil samples may be analyzed for tritium and gamma spectroscopy. Vegetation monitoring may consist of annual collection of 4 vegetation samples at the MWL. Vegetation samples may be analyzed for tritium and gamma spectroscopy. Air monitoring may consist of annual collection of 4 air samples at the MWL. Air samples may be analyzed for tritium, gamma spectroscopy, and gross alpha/beta activity.

The MWL CMS cost estimates do not include costs for sampling and analysis plans, which will be included in the MWL Post-Closure Care Plan.

3. Vadose Zone Monitoring Costs

Costs for installation of a vadose zone monitoring system and thirty years of vadose zone monitoring are included in the following alternatives:

- Alternative MWL III.a. - Bio-Intrusion Barrier
- Alternative MWL III.b - Vegetative Cover
- Alternative MWL III.c - Vegetative Soil Cover with Bio-Intrusion Barrier
- Alternative MWL III.d - RCRA C Cap
- Alternative MWL III.e - RCRA C Cap with Bio-Intrusion Barrier
- Alternative MWL V.e - Future Excavation

The vadose zone monitoring system may include three vadose FLUTe sampling systems installed to a depth of 250 ft bgs and three neutron probe access holes installed at a 45-degree angle to a depth of 142 ft bgs. Vadose zone monitoring boreholes will be installed using conventional drilling technology. A detailed description of vadose zone monitoring activities, the frequency at which they will be performed, and corrective action triggers will be determined in consultation with the NMED and addressed in the MWL Post-Closure Care Plan.

The vadose FLUTe systems may include 5 access ports, installed at increments of 50 ft to 250 ft bgs. The ports may be sampled annually for tritium and volatile organic compounds. Neutron probe access holes may be monitored annually for moisture content to 142 ft bgs. More frequent vadose zone sampling and neutron moisture monitoring may be advantageous during the first

two years of monitoring to establish baseline conditions. The additional costs for more frequent sampling are not included in this module.

4. Waste Volume Estimates

Waste volume estimates are based on the depth of excavation and the dimensions of each pit and trench (Table F-1). The excavation cost estimates in Chapter 3 assume that the classified area will be excavated to a depth of 30 ft and the unclassified area excavated to a depth of 20 ft. For sidewall protection, the side-slopes (rise:run) will be 3:1. Excavated material will be segregated into soil and debris. All material from pits and trenches is considered debris with the exception of the upper three feet of backfill soil in each pit and trench. Debris includes waste as well as packaging, containers, demolition and construction materials and contaminated soil. All excavated material from outside the pits or trenches is assumed to be soil.

Soil volume expansion after excavation was accounted for by assuming a volume ratio of 1.3 to 1 for excavated soils to bank soils. This ratio was estimated based on engineering experience with similar excavation activities at the Chemical Waste Landfill (CWL) and at borrow pits established west of the Corrective Action Management Unit (CAMU).

5. Waste Characterization and Disposal

Waste characterization costs are based on characterization costs determined during the CWL excavation. Characterization of soil will cost approximately $1000/yd^3$. Characterization of debris will cost approximately $10,000/yd^3$.

Waste shipping and disposal costs are a function of whether the waste is radioactive or mixed waste. All debris from pits and trenches is considered mixed waste. All excavated soil is considered radioactive waste. The estimated disposal cost for mixed waste is $8100/yd^3$. The estimated disposal cost for radioactive waste is $810/yd^3$. These costs were obtained directly from the SNL/NM Radioactive and Mixed Waste Management Facility (RWMF).

6. Waste Storage Requirements

Waste storage and shipping containers must meet Nevada Test Site and EnviroCare of Utah waste acceptance criteria. Soils will be stored in 7 ft by 4 ft by 2 ft ("742") steel containers

Table F-1
Soil and Debris Volumes Calculated from MWL Trench and Pit Dimensions

Trench/Pit	Length (ft)	Width (ft)	Diameter (ft)	Depth (ft)	Area (ft^2)	Volume (ft^3)	Volume of Soil[c] in Trench/Pit (ft^3)	Volume of Debris[d] in Trench/Pit (ft^3)
Unclassified Area								
Trench A	153	33	NA[a]	15	*5080.37*[b]	76206	15241	60964
Trench B	157	25	NA	15	*3925.5*	58882	11776	47106
Trench C	121	31	NA	15	*3753.7*	56306	11261	45044
Trench D	162	45	NA	20	*7308.3*	146165	21925	124241
Trench E	175	37	NA	15	*6493.9*	97409	19482	77927
Trench F	180	44	NA	20	*7861.7*	157233	23585	133648
Trench G	81	54	NA	20	*4371.0*	87420	13113	74307
Classified Area								
Pit SP-1	8	6	NA	15	48	720	144	576
Pit SP-2	34	8	NA	15	272	4080	816	3264
Pit SP-3	14	10	NA	15	140	2100	420	1680
Pit SP-4	8	8	NA	20	64	1280	192	1088
Pit SP-5	10	10	NA	20	100	2000	300	1700
Pit 1	NA	NA	6	15	28	424	85	339
Pit 2	NA	NA	6	15	28	424	85	339
Pit 3A	NA	NA	6	15	28	424	85	339
Pit 3B	NA	NA	6	15	28	424	85	339
Pit 4	NA	NA	7	15	38	577	115	462
Pit 5	NA	NA	6	15	28	424	85	339
Pit 6	NA	NA	6	15	28	424	85	339
Pit 7	NA	NA	7	15	38	577	115	462
Pit 8	NA	NA	6	15	28	424	85	339
Pit 9	10	10	NA	25	100	2500	300	2200
Pit 10	10	10	NA	25	100	2500	300	2200
Pit 11	10	10	NA	25	100	2500	300	2200
Pit 12	10	10	NA	25	100	2500	300	2200
Pit 13	10	10	NA	25	100	2500	300	2200
Pit 14	12	12	NA	25	144	3600	432	3168
Pit 15	12	12	NA	25	144	3600	432	3168
Pit 16	10	10	NA	25	100	2500	300	2200
Pit 17	10	10	NA	25	100	2500	300	2200
Pit 18	10	10	NA	25	100	2500	300	2200
Pit 19	10	10	NA	25	100	2500	300	2200
Pit 21	10	10	NA	25	100	2500	300	2200
Pit 24	10	10	NA	25	100	2500	300	2200
Pit 25	10	10	NA	25	100	2500	300	2200
Pit 26	10	10	NA	25	100	2500	300	2200
Pit 27	10	10	NA	25	100	2500	300	2200
Pit 28	10	10	NA	25	100	2500	300	2200

Refer to footnotes at end of table.

Table F-1 (Concluded)
Soil and Debris Volumes Calculated from MWL Trench and Pit Dimensions

Trench/Pit	Length (ft)	Width (ft)	Diameter (ft)	Depth (ft)	Area (ft^2)	Volume (ft^3)	Volume of Soil[c] in Trench/Pit (ft^3)	Volume of Debris[d] in Trench/Pit (ft^3)
Pit 30	NA	NA	4	15	13	188	38	151
Pit 31	10	10	NA	25	100	2500	300	2200
Pit 32	10	10	NA	25	100	2500	300	2200
Pit 33	10	10	NA	25	100	2500	300	2200
Pit 34	10	10	NA	25	100	2500	300	2200
Pit 35	10	10	NA	25	100	2500	300	2200
Pit 36	10	10	NA	25	100	2500	300	2200
Pit U-1	10	10	NA	25	100	2500	300	2200
Pit U-2	10	10	NA	25	100	2500	300	2200
Pit U-3	10	10	NA	25	100	2500	300	2200

[a]NA - Not Applicable.
[b]The exact area of each trench was calculated by Sandia's Graphical Information System (GIS) group, based on geophysical survey data of MWL trenches obtained during the Phase 2 RFI.
[c]The upper 3 feet of each trench or pit are assumed to contain backfilled soil, rather than debris. For the purpose of cost estimating, this soil was considered to be low level radioactive waste, rather than mixed waste. The remainder of each trench or pit was considered debris and mixed waste.
[d]Debris includes packaging, containers, demolition and construction materials, and the radioactive wastes themselves.

which will be filled to full capacity (2 yd^3). Waste from the pits and trenches will be stored in 7 ft by 4 ft by 4 ft ("744") steel containers which will be filled to 70 percent of full capacity (2.9 yd^3). SNL waste management requirements limit stacking of 742 containers to 3 high and stacking of 744 containers to 2 high. Fourteen ft of aisle space is required for forklift access in all high bay warehouses. Three ft of space is required between all waste boxes for inspections. Additional waste storage requirements are provided in Appendix D - Cost Summary Details for High Bay Warehouse Facilities.

7. Operations and Maintenance Costs

All operations and maintenance costs were calculated by RACER for alternatives which were carried through to Chapter 4 of the CMS. Operations and maintenance costs were estimated for thirty years. Operations and maintenance costs for the future excavation scenario were considered to be negligible ($0) although there will be some O&M costs for operations of the high bay warehouse facility. No costs are included for decontamination and decommissioning (D&D) of the facility.

8. CMS Cost Definitions

Contingency—An unknown or unforeseen condition that might increase cost during the execution of a project; used in an estimate to cover costs for contingency.

Direct Costs—Direct costs include all of the costs that can be directly attributed to a particular item of work or activity required to accomplish the project. Direct costs include direct labor costs (which includes wages paid to employees who conduct the work); the cost for purchasing materials used in the performance of the project; and the cost of construction equipment used in the performance of the work. The prime contractor's direct cost also includes the total subcontractor's price including overhead and profit.

Escalation—Price adjustment, from the current date to the date on which work will be performed.

Inflation Factors for Direct Costs—All inflation factors were default parameters used by the *RACER* program, and are based on Office of Management and Budget inflation factors.

Markup—Markups are all costs other than direct costs that do not become a permanent part of the facilities nor contribute to the studies or design. Markup templates are included in the *RACER* program.

Source of Cost Data from *RACER*—The database used by *RACER* is the ECHOS© cost database. ECHOS©, the Environmental Cost Handling Options and Solutions, gathers, monitors, and develops detailed line-items and component costs needed to prepare or verify cost estimates for environmental restoration projects.